breaking off the ſmall ſeal'd neck of the Bubble (without at all ſtirring the ſights, object, or glaſs) and admitting the external Air, you will find your ſelf unable to ſee the utmoſt ends of the object; but the terminating rayes A E and A D (which were before refracted to G and F by the rarified Air) will proceed almoſt directly to I and H; which alteration of the rayes (ſeeing there is no other alteration made in the Organ by which the Experiment is tryed, ſave only the admiſſion, or excluſion of the condens'd Air) muſt neceſſarily be cauſed by the variation of the *medium* contain'd in the Glaſs B; the greateſt difficulty in the making of which Experiment, is from the uneven ſurfaces of the bubble, which will repreſent an uneven image of the object.

Now, that there is ſuch a difference of the upper and under parts of the Air, is clear enough evinc'd from the late improvement of the *Torricellian* Experiment, which has been tryed at the tops and feet of Mountains; and may be further illuſtrated, and inquired into, by a means, which ſome whiles ſince I thought of, and us'd, for the finding by what degrees the Air paſſes from ſuch a degree of Denſity to ſuch a degree of Rarity. And another, for the finding what preſſure was requiſite to make it paſs from ſuch a degree of Rarefaction to a determinate Denſity: Which Experiments, becauſe they may be uſeful to illuſtrate the preſent Inquiry, I ſhall briefly deſcribe.

Fig. 3. I took then a ſmall Glaſs-pipe A B, about the bigneſs of a Swans quill, and about four foot long, which was very equally drawn, ſo that, as far as I could perceive, no one part was bigger then another: This Tube (being open at both ends) I fitted into another ſmall Tube D E, that had a ſmall bore juſt big enough to contain the ſmall Pipe, and this was ſeal'd up at one, and open at the other, end; about which open end I faſtned a ſmall wooden box C with cement, ſo that filling the bigger Tube, and part of the box, with Quickſilver, I could thruſt the ſmaller Tube into it, till it were all covered with the Quickſilver: Having thus done, I faſtned my bigger Tube againſt the ſide of a wall, that it might ſtand the ſteadier, and plunging the ſmall Tube cleer under the *Mercury* in the box, I ſtopt the upper end of it very faſt with cement, then lifting up the ſmall Tube, I drew it up by a ſmall pully, and a ſtring that I had faſtned to the top of the Room, and found the height of the *Mercurial Cylinder* to be about twenty nine inches.

Then letting down the Tube again, I opened the top, and then thruſt down the ſmall Tube, till I perceived the Quickſilver to riſe within it to a mark that I had plac'd juſt an inch from the top; and immediately clapping on a ſmall peice of cement that I had kept warm, I with a hot Iron ſeal'd up the top very faſt, then letting it cool (that both the cement might grow hard, and more eſpecially, that the Air might come to its temper, natural for the Day I try'd the Experiment in) I obſerv'd diligently, and found the included Air to be exactly an Inch.

Here you are to take notice, that after the Air is ſeal'd up, the top of the Tube is not to be elevated above the ſuperficies of the Quickſilver in

in the box, till the ſurface of that within the Tube be equal to it, for the Quickſilver (as I have elſewhere prov'd) being more heterogeneous to the Glaſs then the Air, will not naturally riſe up ſo high within the ſmall Pipe, as the ſuperficies of the *Mercury* in the box; and therefore you are to obſerve, how much below the outward ſuperficies of the *Mercury* in the box, that of the ſame in the Tube does ſtand, when the top being open, free ingreſs is admitted to the outward Air.

Having thus done, I permitted the *Cylinder*, or ſmall Pipe, to riſe out of the box, till I found the ſurface of the Quickſilver in the Pipe to be two inches above that in the box, and found the Air to have expanded it ſelf but one ſixteenth part of an inch; then drawing up the ſmall pipe, till I found the height of the Quickſilver within to be four inches above that without, I obſerved the Air to be expanded only $\frac{1}{7}$ of an inch more then it was at firſt, and to take up the room of $1\frac{1}{7}$ inch: then I raiſed the Tube till the Cylinder was ſix inches high, and found the Air to take up $1\frac{2}{9}$ inches of room in the Pipe; then to 8, 10, 12. *&c.* the expanſion of the Air that I found to each of which Cylinders are ſet down in the following Table; where the firſt row ſignifies the height of the *Mercurial Cylinder*; the next, the expanſion of the Air; the third, the preſſure of the *Atmoſphere*, or the higheſt *Cylinder* of *Mercury*, which was then neer thirty inches: The laſt ſignifies the force of the Air ſo expanded, which is found by ſubſtracting the firſt row of numbers out of the third; for having found, that the outward Air would then keep up the Quickſilver to thirty inches, look whatever of that height is wanting muſt be attributed to the Elater of the Air depreſſing. And therefore having the Expanſion in the ſecond row, and the height of the ſubjacent *Cylinder* of *Mercury* in the firſt, and the greateſt height of the *Cylinder* of *Mercury*, which of it ſelf counterballances the whole preſſure of the *Atmoſphere*; by ſubſtracting the numbers of the firſt row out of the numbers of the third, you will have the meaſure of the *Cylinders* ſo depreſt, and conſequently the force of the Air, in the ſeveral Expanſions, regiſtred.

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